Cloud Computing and Artificial Intelligence

OVERVIEW

Cloud services represent a transformative technology that can improve many of Oceanic and Atmospheric Research (OAR) and Integrated Ocean Observing System (IOOS) functions—observations, data management, forecasting, and end-user products and applications—to better serve the public. Shifting to cloud computing and implementing Artificial Intelligence (AI) strategies will better unlock the full utility and potential of NOAA, OAR, and IOOS’ massive and diverse data.

Reflective of OAR’s and IOOS’ diverse missions, the available ocean and Great Lakes data is vast, complex, non-standardized, and distributed—and the systems and infrastructure that process, store, and disseminate these data are just as complex. Additionally, the volume and variety of OAR’s and IOOS’ ocean and Great Lakes data are expected to increase with the deployment of new observing systems and the increase of data-acquisition capabilities.
Enhancing OAR and IOOS observational, research, and operational collaborative efforts will allow for the development and implementation of a cohesive cloud and data strategy that will: 1) drive innovation and guide advancements in science, products, and services; 2) accelerate the implementation of the most effective science and technology applications; and, 3) scale the infrastructure and services needed to support this growth. Implementing standardized strategies across organizations is challenging and a priority outcome of these workshops is advancing specific recommendations to forward these goals.

**Priority topics:**

- Leverage cloud computing as connector across organizations, especially for data quality assessment/quality control (QA/QC). Cloud, artificial intelligence, and machine learning (ML) services can serve to connect different government agencies and external partners, and support the increasing demand for data across different platforms and datasets.
- Establish protocols for IOOS-OAR collaborations (e.g., protocols for Zarr, a storage format which makes large datasets easily accessible to distributed computing).
- Develop consistent cloud terminology and cloud vendors across IOOS and OAR.
- Develop a list of high-priority needs and identify the strongest overlap between IOOS and OAR that would be best targeted by cloud computing and AI/ML approaches.
- Improve access to variables that support interpreting ocean acidification and hypoxia impacts, particularly biology.
- Identify needs and applications for which edge processing is most fitting.
- Publicize a grand prize with a tiered prize structure for the AI community to effectively and efficiently leverage external expertise to generate innovative solutions for key problems. For an example, see the IOOS Southern California Coastal Ocean Observing System (SCCOOS) participation in a challenge with computer science graduate students at the University of California San Diego.

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